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Vibration Characteristics of Functionally Graded Material Skew Plate in Thermal Environment

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Abstract : In the present investigation, free vibration of functionally graded material (FGM) skew plates under thermal environment is studied. Kinematics equations are based on the Reddy's higher order shear deformation theory and a nine noded isoparametric Lagrangian element is adopted to mesh the plate geometry. The issue of C1 continuity requirement related to the assumed displacement field has been circumvented effectively to develop C0 finite element formulation. Effective mechanical properties of the constituents of the plate are considered to be as position and temperature dependent and assumed to vary in the thickness direction according to a simple power law distribution. The displacement components of a rectangular plate are mapped into skew plate geometry by means of suitable transformation rule. One dimensional Fourier heat conduction equation is used to ascertain the temperature profile of the plate along thickness direction. Influence of different parameters such as volume fraction index, boundary condition, aspect ratio, thickness ratio and temperature field on frequency parameter of the FGM skew plate is demonstrated by performing various examples and the related findings are discussed briefly. New results are generated for vibration of the FGM skew plate under thermal environment, for the first time, which may be implemented in the future research involving similar kind of problems.

Keywords : Functionally graded material, finite element method, higher order shear deformation theory, skew plate, thermal vibration.
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